



Northwest Missouri State University Biomass Project:

A Twenty-five Year Case Study.

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Building a Culture of Quality: Alternative Energy Resources

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Northwest Has Been a Leader for 25 Years in Waste Resources to Energy Innovations



Historical Background

- Fuel oil delivered daily in a tanker truck from Memphis, Tennessee, 600 miles away
- University support staff highly motivated to reduce dependence on unreliable petroleum-based energy sources
- Desire and the will to explore the edge

Criteria for a Major Cultural Change

- ✍ Availability of a Large, Diverse Supply of Energy Resources
- ✍ Environmentally Safe and Compatible with Existing Systems
- ✍ Minimal Effect on Campus Aesthetics
- ✍ Contributes to Conservation of Fossil Fuels
- ✍ Represents a Truly Renewable Energy Source
- ✍ Convenient Storage and Access

Criteria for a Major Cultural Change

- ✍ Constructed From Off the Shelf Equipment and Hardware
- ✍ Minimal Operator Training Required
- ✍ Enhances the Quality of Life for Regional Constituents
- ✍ Potential for Significant Cost Savings
- ✍ Provides for Redundancy and Diversity of Energy Sources
- ✍ Decreases Missouri's Out of State Energy Dependency

Wood Chips-Phase I-1979

Utilize Waste Wood Resources From the
Wood Products Industry



Paper Pellets-Phase II-1990

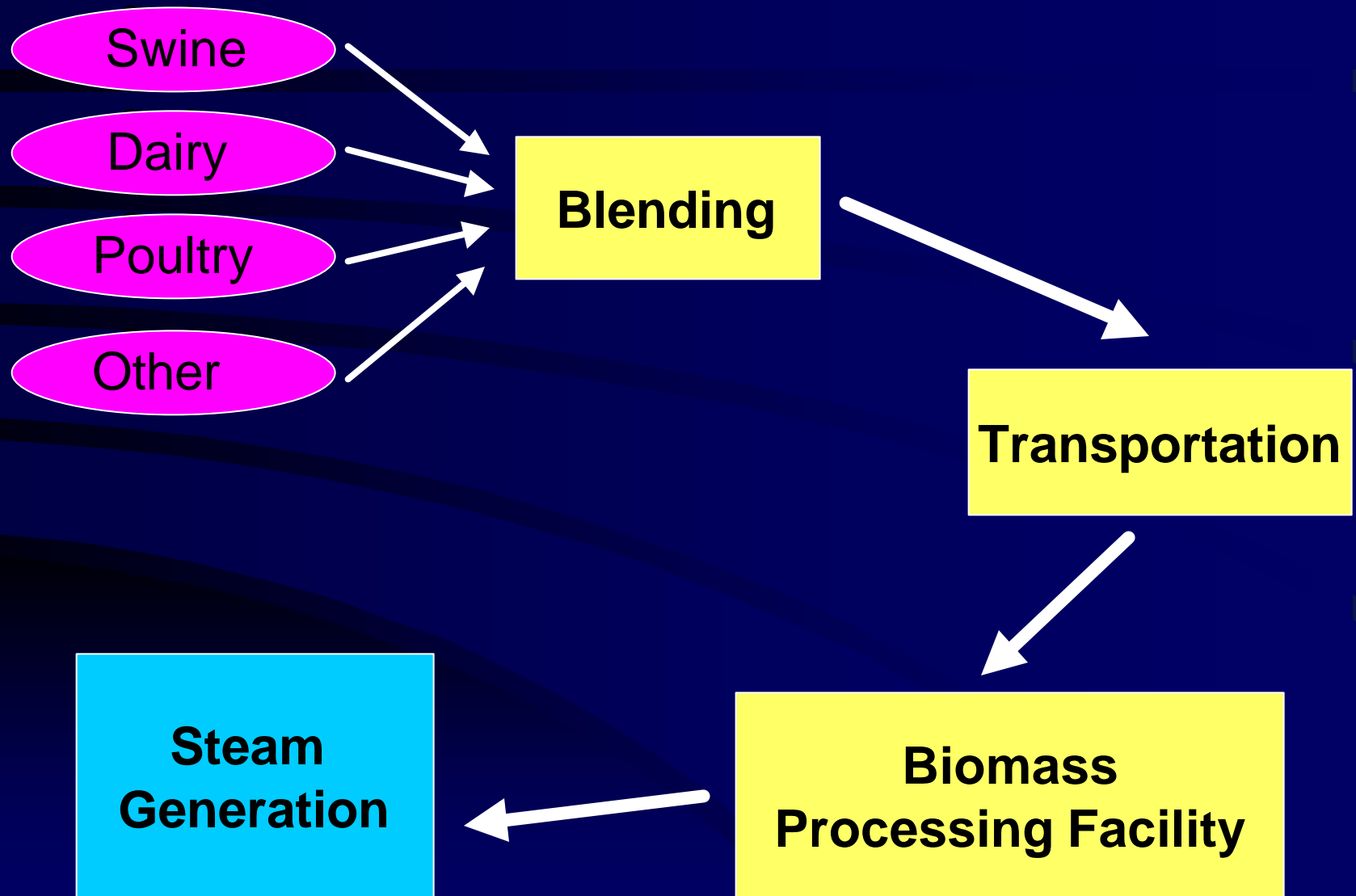
Reclaimed From Un-Recyclable and Unsoiled Paper Waste Products From the Five-County Regional Landfill



Animal Waste Resources-Phase II- 1994

- Research verifies solid concept
- Patented process in place
- Significant environmental savings by reducing:
 - > Odors by 98%
 - > Lagoon solids by 95 plus %
- Projections (estimates at this time):
 - > Reduce further fossil fuel dependency by 5 %
 - > Reduce energy cost by \$ 50,000
 - > Reallocated dollars yet to be determined

Biomass to Bio-fuels to Bioenergy



Power Plant Fuel Usage

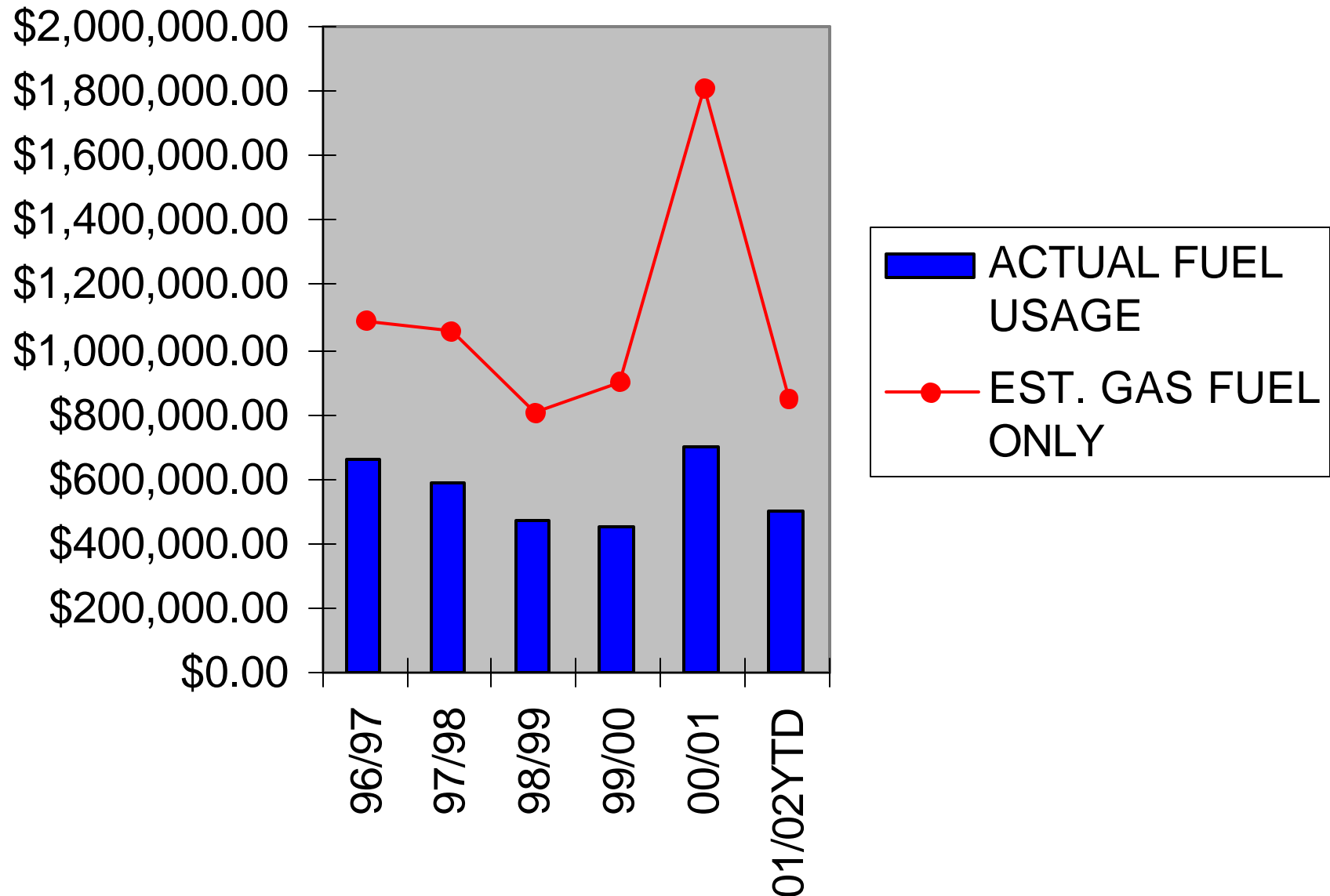
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Wood	14,632 tons
Paper	2,233 tons
Oil	185,442 gallons
Natural Gas	28,196 DTH

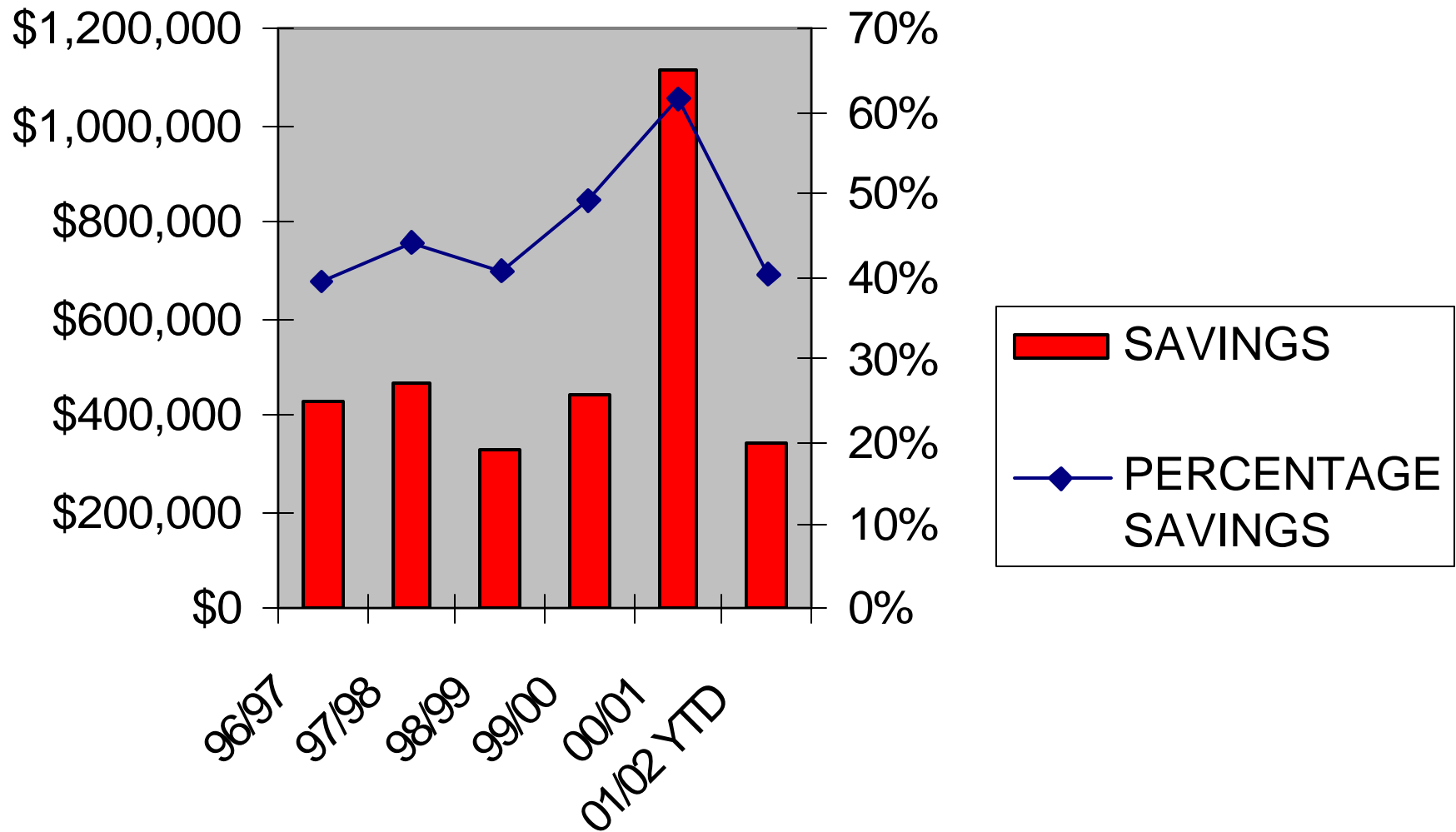
Estimated Energy Value and Cost of Resources

	Btu/lb.	\$/MMBtu
• Woodchips	5274 - 7414	1.84
• Paper Pellets	5782 - 6044	2.46
• Animal Waste	5000 – 6000	3.30
• Natural Gas	1 ft ³ = 1000 Btu	6.67
• #5 Fuel Oil	1 gal = 144,000 Btu	4.32

Fuel Cost Comparison \$



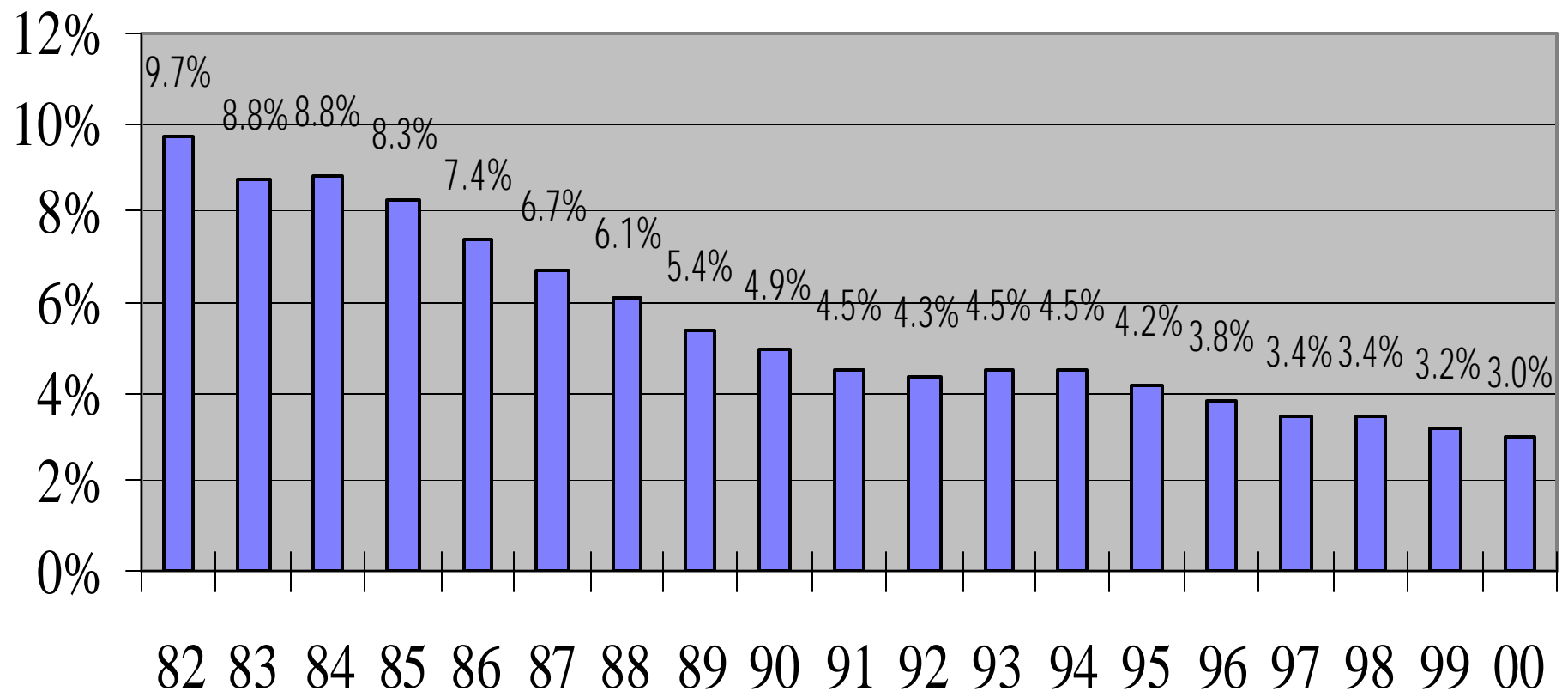
Savings From Use Of Alternative Fuel



Utility Cost As A Percentage Of Total

E&G Expenditures

Northwets Missouri State University



Proven Alternative Fuel Sources

Paper

Woodchips

Livestock

Sawdust

Switchgrass

Others

Seed Cleanings

Historical Perspective

Newspaper Headline -United States Balance of Payments For October 1996 < \$12, 000, 000, 000 >

No One Cared In 1996 That Missouri's Energy Balance Of Payments Was < \$9,000,000,000 >

In 2001 It Was Over < \$12,000,000,000 >

Proven Biomass Fuel Reserves

**50% Of “Missouri’s Known” Biomass
Reserves Would Replace 20% Of Our
State’s Imported Fossil Fuel Used For
Electrical Power GenerationDNR 2001**

A Process To Build A Successful Strategy For Missouri's Energy Future

Missouri Agriculture Can Build A New Culture Of Energy Quality

- A vision for alternative energy application
- A set of values to build a new energy future
- A set of criteria to guide decision making
- A set of desired measurable outcomes

Proven Steps To Missouri's Energy Future

- Step 1: A Culture Of Energy Quality
- Step 2: Field Analysis Reports
- Step 3: Test Burn Reports
- Step 4: Flue Gas Analysis Reports
- Step 5: Training Curriculum

Challenge To Missouri's Ethanol and Bio Diesel Industry

BE NUMBER ONE TO:

- Base Load Your Production Systems With Biomass Energy
- Reduce Missouri Dependence on Imported Fossil
- Take The Lead In A Rural And Urban Partnership
- Cleaning Up Missouri's Environment
- Be A Model For Community Responsibility
- Increase Energy Efficiency Of Renewable Energy Production

**“Our Most Important
Responsibility is to
be Good Ancestors”**

.....Jonas Salk

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